

Issues for Use of Climate Models to Inform Policymakers, Assess Impacts, and Develop Adaptive Strategies

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Climate Model Capabilities

1. Existing climate models *cannot* credibly produce future weather scenarios of other than the gross geographic and seasonal distribution of mean surface temperature.
2. This is because they *cannot* adequately reproduce these features over the recent historical record.
3. To adequately reproduce weather scenarios for the recent historical record, existing climate models must be able to reproduce the form, seasonality, and variance of the phenomenon that constitute the dominant controls on weather systems and their variability.
4. No existing climate model has been shown to collectively or correctly treat more than half of the critical controls on North American weather.



<i>Parameters and/or trend(s)</i>	<i>Level of practical interest to policy makers, adaptive planners, and resource managers</i>	<i>Ability of climate models to reproduce over the last 50 years</i>
Mean annual global surface temperature	None	Exceptional
Regional and seasonal mean surface temperature and precipitation and their interannual variability	Considerable	Fair to poor for surface temperature and poor for precipitation
Regional and seasonal intraseasonal variability, especially risks of weather extremes and high-impact events	Intense	Poor or unknown

North America Climate/Weather Links

1. El Nino/La Nina controls:
 - Atlantic/Gulf Tropical Storm/Hurricane activity
 - Winter and spring storm tracks
 - Temperature extremes
2. Subseasonal links to tropical variability:
 - Most active when El Nino absent or La Nina weak (for example Winter 1996-97)
 - Recurrence from 3 to 7 weeks (includes the classic Madden-Julian Oscillation)
 - West coast precipitation, central and eastern U.S. and Canada cold outbreaks, and Atlantic/Gulf Tropical Storm/Hurricane activity
3. Other
 - N. Atlantic Oscillation
 - Land/Surface Processes and Feedback: Southwest monsoon, soil moisture, snow, etc.

What about Downscaling?

1. Models which don't represent the current climate well cannot be credibly downscaled statistically
2. Models of future climate cannot be credibly downscaled statistically because climate change is inherently a non-stationary process
3. Nested model downscaling implies major technical challenges as well as assumptions about scale interactions if attempted for future climates (solution is global high-resolution models)

Take Home Messages

1. Impact assessment and scenario development must approach climate model output far more critically, conducting expert and thorough historical record validation of all critical aspects of the problem as a first mandatory step.
2. Model validation needs greater research attention, both to meet user needs above and to sensitize modelers to deficiencies.
3. More attention needs to be paid to the development of credible meso-scale (to avoid downscaling compromises) global coupled models that correctly treat the full spectrum of variability.